LET'S REVIEW

CLOCK PROBLEMS

ENGR. DARIO A. CALAQUE, JR.

ENGR. DARIO A. CALAQUE, JR.

ALL RIGHTS RESERVED

CLOCK TERMINOLOGIES:

EXPLODED VIEW OF CLOCK

Second Hand

Minute Hand

Hour Hand

TRIVIA:

The term "o'clock" is a contraction of the term "of the clock". It comes from 15th-century references to medieval mechanical clocks. At the time, sundials were also common timekeepers. Therefore, to make clear one was referencing a clock's time, they would say something like, "It is six of the clock" — which, over time, was shortened to "six o'clock".

ENGR. CALAQUE, D. ENGR. DARIO A. CALAQUE, JR

ALL RIGHTS RESERVED

ANALYSIS:

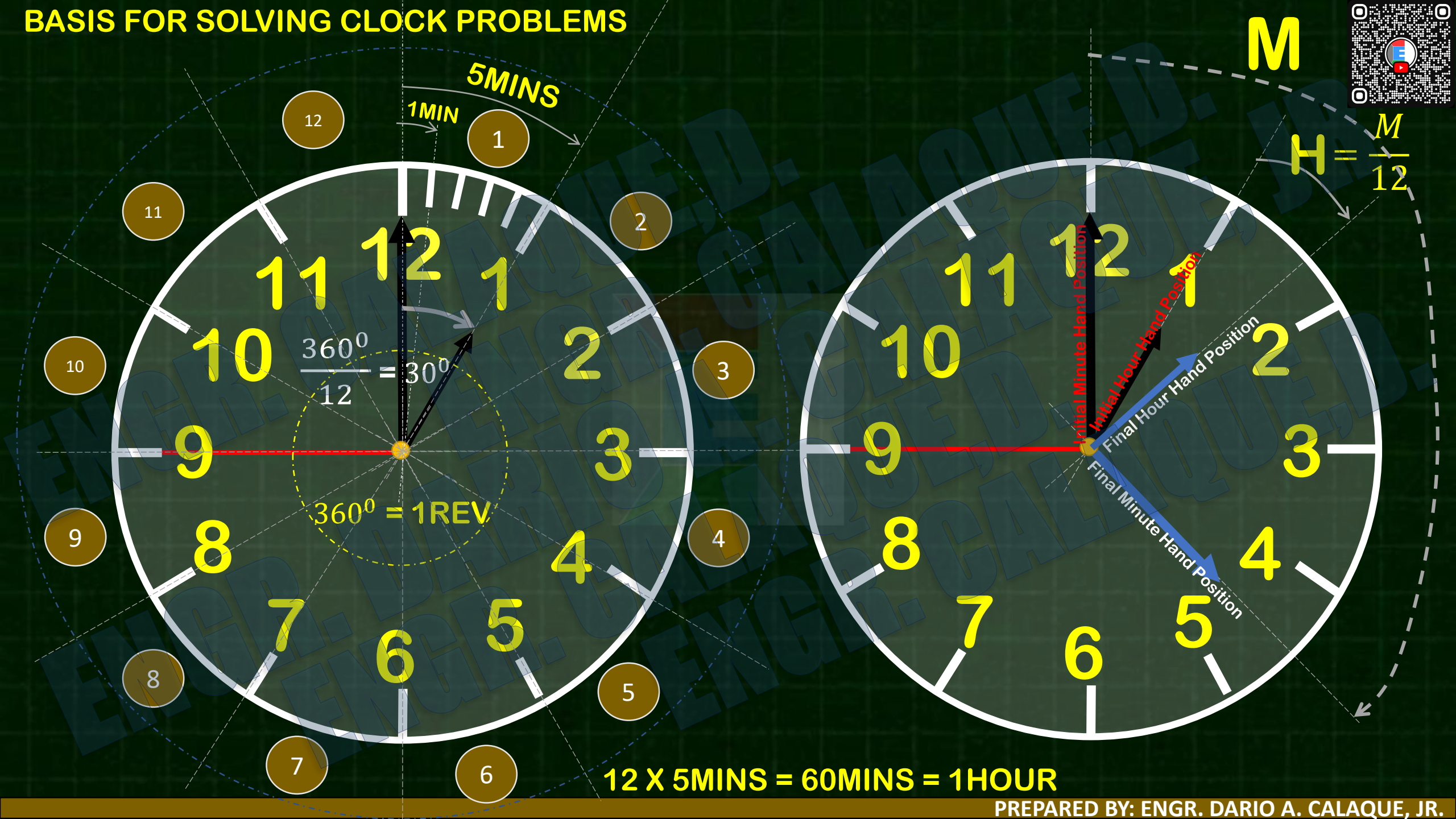
1) If the minute hand moves a distance of “M”, the hour hand moves “M/12”

2) Each five minute mark is subtends an angle of 30degrees from the center of the clock.

ENGR. CALAQUE, JR

ALL RIGHTS RESERVED

BASIS FOR SOLVING CLOCK PROBLEMS



ENGR. DARIO A. CALAQUE, JR.

ANALYSIS:

3) If the second hand moves a distance of "S", the minute hand moves "S/60" and the hour hand moves "$\frac{S}{60(12)} = \frac{S}{720}$"

ENGR. DARIO A. CALAQUE, JR

ALL RIGHTS RESERVED

$$H = \frac{M}{12} = \frac{1}{12}\left(\frac{S}{60}\right) = \frac{S}{720}$$

$$M = \frac{S}{60}$$

Note: 1minute = 60seconds

ENGR. CALAQUE, JR.

ALL RIGHTS RESERVED

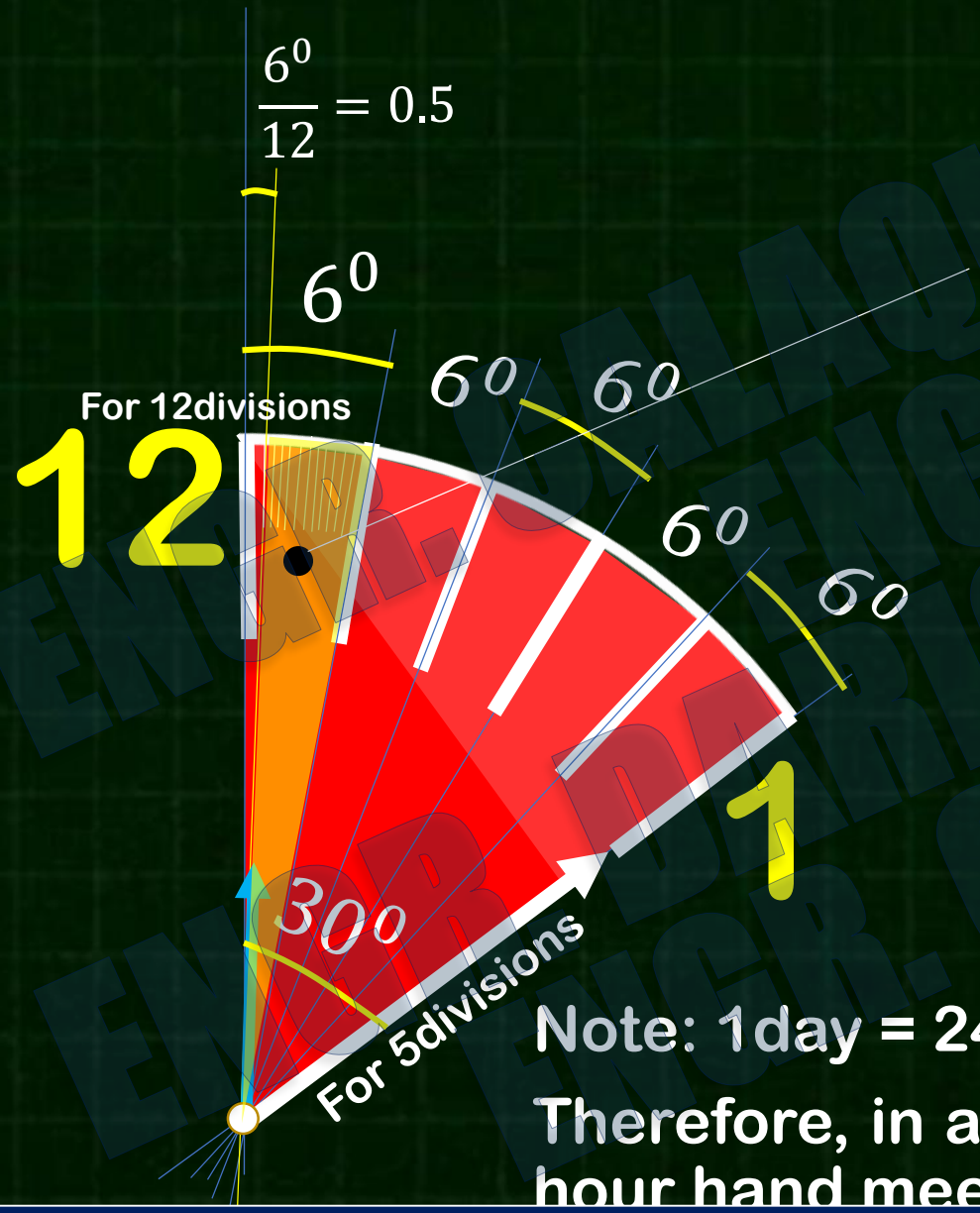
ANALYSIS:

4) In 12hours, the minute hand and the hour hand of the clock overlap each other for 11times (not 12times). So in one day, they will be together for 22times

https://sikademy.com/career-training/iq-aptitude-and-vocational-training/puzzles-for-interview-training/hands-of-a-clock/#:~:text=This%20means%20that%20every%2065.45%20minutes%2C%20the%20minute,hour%20hand%20meets%2022%20times%20in%20a%20day

PREPARED BY: ENGR DARIO A CALAQUE, JR ALL RIGHTS RESERVED

ANALYSIS:



Speed of minute hand in 1minute is: 360/60 = 6degrees per minute

Speed of hour hand in 1minute is: 360/720 = 0.5 degrees per minute

Speed between the minute and hour hand = 6 - 0.5 = 5.5 degrees per minute

If we consider 12am as the reference point where minute and hours coincide, the distance covered between them is 360degrees.

Distance/Speed = 360degrees/ (5.5degrees per minute) = 65.45minutes

This means that EVERY 65.45minutes, the minute hand and hour hand meets

Note: 1day = 24hours x (60min per hour) = 1440minutes per day

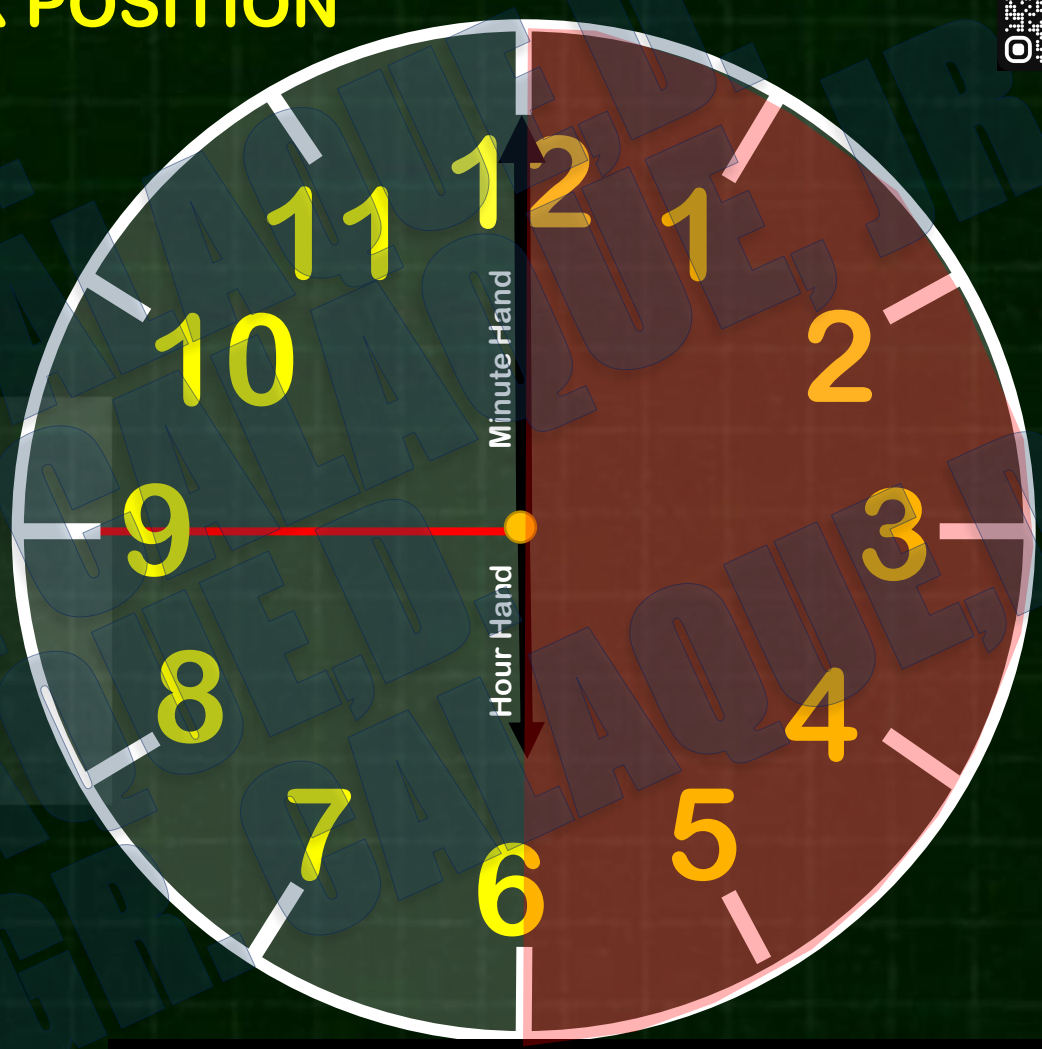
Therefore, in a day which is 1440minutes, the minute hand and hour hand meets:1440minutes/65.45minutes = 22times in a day

PREPARED BY: ENGR DARIO A CALAQUE, JR
ALL RIGHTS RESERVED

DESIRED CLOCK POSITION

TO FORM HANDS TOGETHER OR COINCIDE

$M_{desired} = 0$



HANDS EXTENDING OPPOSITE TO EACH OTHER

$M_{desired} = 30\text{mins}$

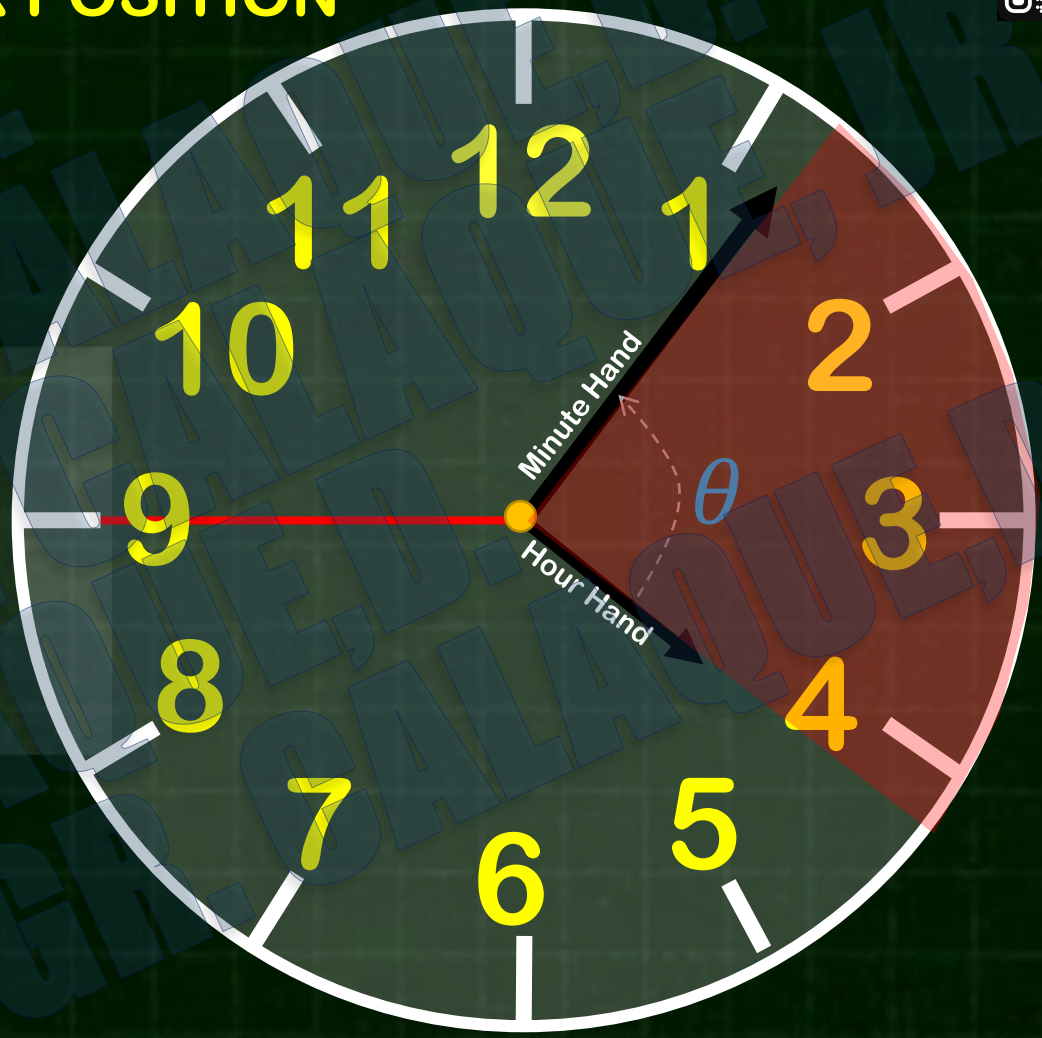
ENGR. CALAQUE, JR

ALL RIGHTS RESERVED

DESIRED CLOCK POSITION

HANDS AT RIGHT ANGLE

$$M_{desired} = 15\text{mins}$$



TO FORM AN ANGLE

$$M_{desired} = \theta\left(\frac{30min}{180^0}\right)$$

ENGR. CALAQUE, JR

ALL RIGHTS RESERVED

DESIRED CLOCK POSITION

BE BISECTED BY
THE SECOND HAND

$$M_{desired} = -2(59M)$$

REFERENCE CLOCK POSITION

$$M_{reference} = 2(5mins) = 10\text{mins}$$

$$M_{reference} = t_{ref}\ (5mins)$$

ENGR. CALAQUE, JR.

ALL RIGHTS RESERVED

PROBLEM

WHAT TIME AFTER 3 O'CLOCK WILL THE HANDS OF THE CLOCK

1) BE TOGETHER FOR THE FIRST TIME?
2) BE AT RIGHT ANGLE FOR THE FIRST TIME?
3) BE EXTENDING OPPOSITE TO EACH OTHER?

ENGR. DARIO A. CALAQUE, JR

ALL RIGHTS RESERVED

ALGEBRA:

WHAT TIME AFTER 3 O'CLOCK WILL THE HANDS OF THE CLOCK BE TOGETHER FOR THE FIRST TIME?

ANSWER:

Time: 3: 16.36

CALTECH

MODE 3[STAT] 2[a+bx]

X (minutes)	Y (Angle)
0	$-3(30^0)$
60	$(12-4)(30^0)$

[CA] [AC] [CASIO 991/570ES] [KARCE KC-S991] [SHIFT] [STAT] [1] [REG] [5] [$\hat{x}$] [4]

[CANON F789SGA] [APPS] [REG] [8] [$\hat{x}$] [4]

$0\hat{x}$ [=] **16.36** $\therefore$ time: 3: 16.36

$$H = \frac{M}{12}$$

CLOCK EQN:

$$M = 15 + \frac{M}{12}$$

$$M = 16.36mins.$$

ENGR. CALAQUE, JR.

ALL RIGHTS RESERVED

ALGEBRA:

WHAT TIME AFTER 3 O'CLOCK WILL THE HANDS OF THE CLOCK BE AT RIGHT ANGLE FOR THE FIRST TIME?

ANSWER: Time: 3: 32.73

CALTECH

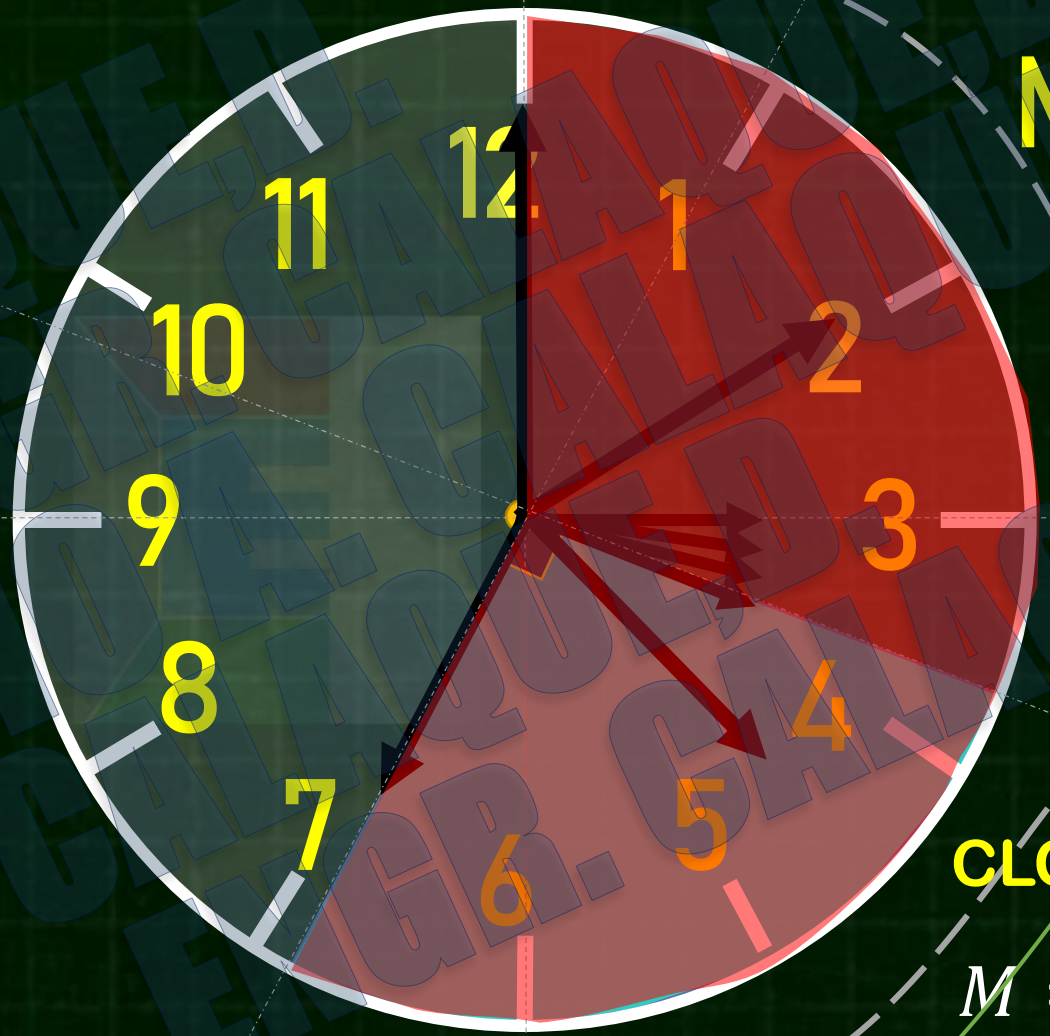
MODE 3[STAT] 2[a+bx]

X (minutes)	Y (Angle)
0	$-3(30^0)$
60	$(12-4)(30^0)$

[CA] [AC] [CASIO 991/570ES] [KARCE KC-S991] [SHIFT] [STAT] [1] [REG] [5] [$\hat{x}$] [4]

[CANON F789SGA] [APPS] [REG] [8] [$\hat{x}$] [4]

$90^0\hat{x}$ [=] 32.73 ∴ time: 3: 32.73



$$H = \frac{M}{12}$$

CLOCK EQN:

$$M = 15 + \frac{M}{12} + 15$$

$$M = 32.73mins.$$

ENGR. CALAQUE, JR.

ALL RIGHTS RESERVED

ALGEBRA:

WHAT TIME AFTER 3 O'CLOCK WILL THE HANDS OF THE CLOCK BE EXTENDING OPPOSITE TO EACH OTHER?

ANSWER: Time: 3: 49.09

CALTECH

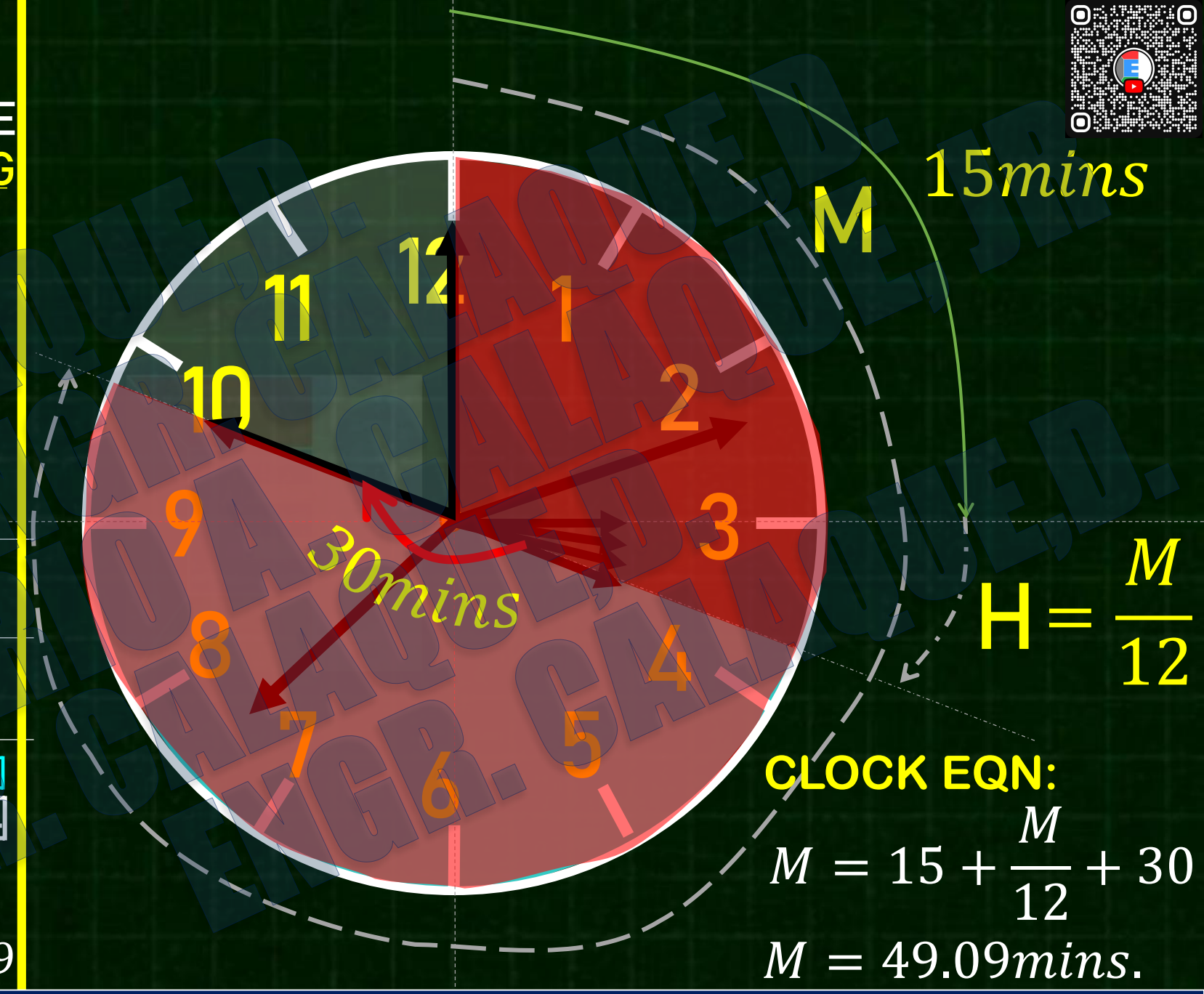
MODE 3[STAT] 2[a+bx]

X (minutes)	Y (Angle)
0	$-3(30^0)$
60	$(12-4)(30^0)$

[CA] [AC] [CASIO 991/570ES] [KARCE KC-S991] [SHIFT] [STAT] [1] [REG] [5] [$\hat{x}$] [4]

[CANON F789SGA] [APPS] [8] [REG] [4] [$\hat{x}$]

$180^0\ \hat{x}$ [=] **49.09** ∴ time: 3: 49.09



$$H = \frac{M}{12}$$

CLOCK EQN:

$$M = 15 + \frac{M}{12} + 30$$

$$M = 49.09mins.$$

ENGR. DARIO A. CALAQUE, JR.

ALL RIGHTS RESERVED

TEST YOURSELF:

In how many minutes after 2o'clock will the hands of the clock extend in opposite directions for the first time?

A. $42.4min$

B. $42.8min$

C. $43.2min$

D. $43.6min$

ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. DARIO A. CALAQUE, JR ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. CALAQUE,D.

TEST YOURSELF:

In how many minutes after 7o'clock will the hands of the clock be directly opposite each other for the first time?

A. $5.22min$

B. $5.33min$

C. $5.45min$

D. $5.54min$

ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. DARIO A. CALAQUE, JR ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. CALAQUE,D.

TEST YOURSELF:

At what time after 12:00nn will the hour hand and minute hand of the clock first form an angle of 120degrees?

A 12: 18.818

B 12: 21.818

C 12: 22.818

D 12: 24.818

ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. DARIO A. CALAQUE, JR ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. CALAQUE,D.

TEST YOURSELF:

At what time between 8 and 9o'clock will the minute hand coincides with the hour hand?

A 8: 42.5

B 8: 43.2

C 8: 43.6

D 8: 43.9

ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. DARIO A. CALAQUE, JR ENGR. CALAQUE,D. ENGR. CALAQUE,D. ENGR. CALAQUE,D.

BISECTED HANDS

PAST CE BOARD EXAM:

WHAT TIME BETWEEN 2 AND 3 O'CLOCK WILL THE ANGLE BETWEEN THE HANDS OF THE CLOCK BE BISECTED BY THE LINE CONNECTING THE CENTER OF THE CLOCK AND THE 3 O'CLOCK MARK?

ENGR. DARIO A. CALAQUE, JR

ALL RIGHTS RESERVED

PAST CE BOARD EXAM:

WHAT TIME BETWEEN 2 AND 3 O'CLOCK WILL THE ANGLE BETWEEN THE HANDS OF THE CLOCK BE BISECTED BY THE LINE CONNECTING THE CENTER OF THE CLOCK AND THE 3 O'CLOCK MARK?

BETWEEN 2 & 3 O'CLOCK

BISECTED BY THE LINE CONNECTING THE CENTER OF THE CLOCK AND THE 3 O'CLOCK MARK

$$H = \frac{M}{12}$$

$$15\text{mins} - 10\text{ mins} - \frac{M}{12} = \theta$$

$$M - 15\text{mins} = \theta$$

ENGR. CALAQUE, D.

BISECTED HANDS

PAST CE BOARD EXAM:

WHAT TIME BETWEEN 2 AND 3 O'CLOCK WILL THE ANGLE BETWEEN THE HANDS OF THE CLOCK BE BISECTED BY THE LINE CONNECTING THE CENTER OF THE CLOCK AND THE 3 O'CLOCK MARK?

KEY EQUATION:

$$15\text{mins} - 10\text{ mins} - \frac{M}{12} = M - 15\text{mins}$$

Solve for M: $M = 18.46\text{mins}$

Time: 2:18.46

ENGR. DARIO A. CALAQUE, D. JR
ENGR. CALAQUE, D.

ALL RIGHTS RESERVED

PAST CE BOARD EXAM:

A MAN LEAVING HIS OFFICE ON ONE AFTERNOON NOTICED THE CLOCK AT PAST 2 O'CLOCK. BETWEEN TWO TO THREE HOURS, HE RETURNED TO HIS OFFICE NOTICING THE HANDS OF THE CLOCK INTERCHANGED. AT WHAT TIME HE RETURNED TO THE OFFICE?

a) 5:12.16

b) 5: 14.23

c) 5: 15.15

d) 5:43.43

ENGR. DARIO A. CALAQUE, JR.

PAST CE BOARD EXAM:

A MAN LEAVING HIS OFFICE ON ONE AFTERNOON NOTICED THE CLOCK AT PAST 2 O'CLOCK. BETWEEN TWO TO THREE HOURS, HE RETURNED TO HIS OFFICE NOTICING THE HANDS OF THE CLOCK INTERCHANGED. AT WHAT TIME DID HE LEAVE THE OFFICE AND THE TIME THAT HE RETURNED TO THE OFFICE?

CLOCK WHEN HE L

$$H_{LEFT} = \frac{M_{LEFT}}{12}$$

$$M_{LEFT}$$

ENGR. CALAQUE, D.
ENGR. DARIO CALAQUE, JR
ENGR. CALAQUE, D.

PAST CE BOARD EXAM:

A MAN LEAVING HIS OFFICE ON ONE AFTERNOON NOTICED THE CLOCK AT PAST 2 O'CLOCK. BETWEEN TWO TO THREE HOURS, HE RETURNED TO HIS OFFICE NOTICING THE HANDS OF THE CLOCK INTERCHANGED. AT WHAT TIME DID HE LEAVE THE OFFICE AND THE TIME THAT HE RETURNED TO THE OFFICE?

CLOCK WHEN HE RE

$$M_{LEFT} = 25 + \frac{M_{RETURN}}{12} \quad \text{...eq'n 1}$$

$$M_{RETURN} = 10 + \frac{M_{LEFT}}{12} \quad \text{...eq'n 2}$$

ENGR. DARIO A. CALAQUE, JR.

INTERCHANGING HANDS

PAST CE BOARD EXAM:

A MAN LEAVING HIS OFFICE ON ONE AFTERNOON NOTICED THE CLOCK AT PAST 2 O'CLOCK. BETWEEN TWO TO THREE HOURS, HE RETURNED TO HIS OFFICE NOTICING THE HANDS OF THE CLOCK INTERCHANGED. AT WHAT TIME DID HE LEAVE THE OFFICE AND THE TIME THAT HE RETURNED TO THE OFFICE?

KEY EQUATIONS:

$$M_{LEFT} = 25 + \frac{M_{RETURN}}{12} \quad \text{...eq'n 1}$$

$$M_{RETURN} = 10 + \frac{M_{LEFT}}{12} \quad \text{...eq'n 2}$$

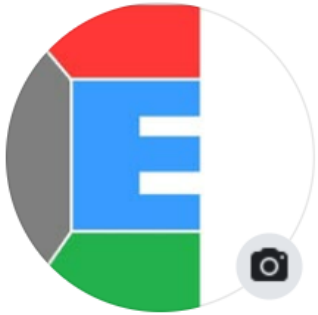
SOLVING 2EQN'S, 2 UNKNOWNS, WE'LL GET:

$M_{LEFT} = 26mins$

time left = 2:26

$M_{RETURN} = 12.16mins$

time return: 5:12.16



Excel, Android and Desktop Applications

2.7K likes • 3.1K followers

Youtube: **https://www.youtube.com/@CALQARE**
Facebook: **https://www.facebook.com/calqare/**
Web: **https://calqare.wordpress.com/**
Blog: **https://calqwebtools.blogspot.com/**

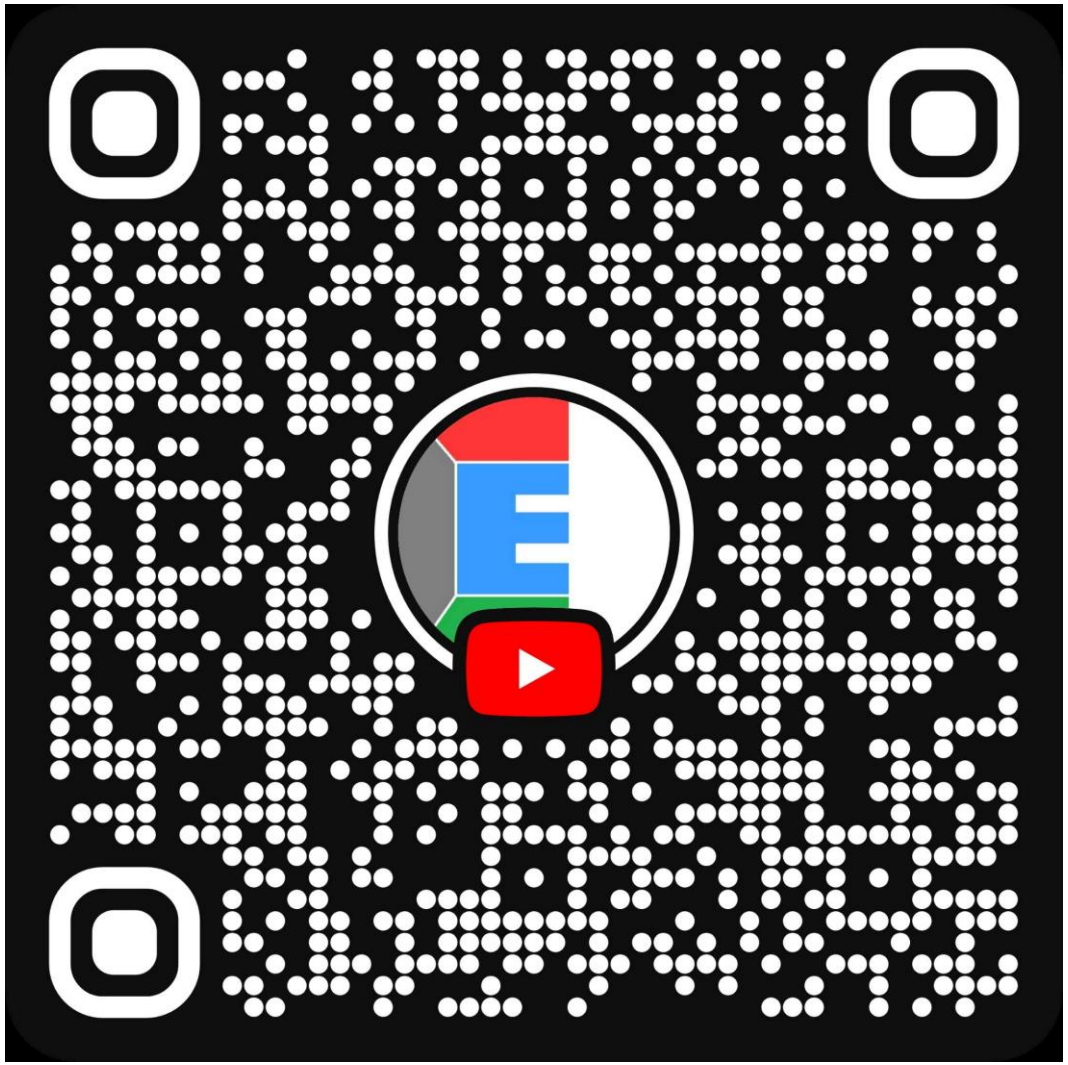
DAC ENGINEERING TUTORIALS

@CALQARE · 16.7K subscribers · 1K videos

"Don't wait for a formal education, find ways to learn" - DAC ...more

calqare.wordpress.com

Subscribed Join



ALL RIGHTS RESERVED